MAY 3 1988

EPA/89/2:600/58-87/059

United States
Environmental Protection
Agency

Air and Energy Engineering
Research Laboratory
Research Triangle Park NC 27711

Research and Development

EPA/600/S8-87/059 Mar. 1988

EPA

Project Summary

Volatile Organic Compound Emission Projection Model User's Manual (Version 1.8)

Mark S. Jennings and Thomas E. Emmel

This report is a user's manual and reference guide for the Volatile Organic Compound Emission Projection Model (VOCM), Version 1.8. It highlights the model's major features, explains the basic operations of the model and defines terms, describes how to install and operate the model, explains how to enter the input data required for the model's operation, and explains how to run a projection with a sample set of user-specified input data.

Manual appendices contain samples of the model's eight data file sheets, along with descriptions of the fields on each sheet; present samples of the model's output and describes the information thereon; and list the limits that the model imposes on certain operational parameters.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The Volatile Organic Compound Emission Projection Model (VOCM) is a program that can model the effects of growth, retirements, and regulations on future emissions of volatile organic compounds (VOCs). It forecasts by projecting the emissions existing in a baseline year into the future, then reducing the projected emissions to levels required by the applicable emission constraint. Data files for a 1980 baseline year are provided with Version 1.8 of the VOCM model. VOCM can also estimate the cost of controlling emissions to the required levels. The program is designed to be used on the IBM-PC family of computers (and 100% compatible computers).

VOCM is an extremely powerful and versatile program. It:

- Can project emisisons for up to 70 years in the future (i.e., beyond the base year of the emissions).
- Can project emissions from as many as 1,000 industrial categories in up to 50 geographic regions.
- Can project emissions from sources existing in the base year and from new and replaced processes that are built during the projection period.
- Allows the user to specify growth rates that are specific to a particular industry in a particular region. The growth rates can change with time.
- Allows the user to apportion growth (new emissions) between attainment and non-attainment areas.
- Can model the effect of up to 500 regulatory and other emission constraints. Each constraint can apply to any combination of regions and industrial categories. Each constraint can apply to existing, new, and/or replaced emissions.

ORIGINAL COMPLETED

- Can determine the costs of controlling the projected emissions to meet applicable constraints.
- Can perform projections for all regions and industrial categories in the data base, or for only certain specified ones.
- Can run projections for more than 1 year at a time.
- Allows the user to import data from other files.
- Allows the user to specify that projection results for certain industrial categories be aggregated and reported under common identifiers.

To run VOCM, the following computer facilities are needed:

- An IBM-PC with two floppy disk drives, or an IBM-PC XT or AT with a hard disk. A machine with a hard disk is needed to efficiently run VOCM for complex problems using large input files similar to those supplied with the model. Another feature that is not required, but will improve performance is a numerics co-processor. VOCM does not need a numerics co-processor to operate, but it will run faster if the computer has one.
- The amount of memory required depends on the complexity of the projections to be run. For simple projections (i.e., those involving relatively few constraints, cost tables, regions, and industrial categories), 320K will usually be enough. For more complex projections, 512K will generally be adequate. Extremely complex projections may require the maximum amount of memory that can be accessed by programs running under PC-DOS (640K).
- PC-DOS (or MS-DOS) Version 2.0 or higher operating system.
- Blank floppy disks to store the data files for floppy disk systems or to back up the data files for hard disk systems.
- A printer to print the results. The printer must be able to print up to 131 columns. VOCM automatically toggles IBM/Epson dot-matrix printers into their compressed printing models, enabling the narrow carriage models to print 131 columns.
- The VOCM program and support files.

The manual gives an overview of the model's operation and its main features. Definition of terms that the model user should be familiar with are also presented. It also describes in detail the procedures to be used to install and operate the VOCM model. Alternative methods of entering data into the model are also described. A sample of user-specified input data is given. Using the sample data inputs, a VOCM model run is shown.

Entering Input Data

Complete flexibility in selection of input data is a feature of the VOCM model that makes it adaptable by the user for analysis of VOC emission control strategies. Before a projection can be run, the user must provide VOCM with the data it needs to function. This can be done in one of two ways: by typing the data into the data files using VOCM's data-entry system (called the "Sheet Editor") or by importing the data from an existing file.

VOCM's Data-Entry System for Keyboard Entered Data: The Sheet Editor

One way to provide VOCM with the data it needs is to type it directly into the data files using VOCM's data-entry system, the Sheet Editor. The Sheet Editor provides for easy entry and manipulation of the input data. It is based on the concept that each data file is organized as a stack of sheets. Each sheet contains blanks in which the user types information. The Sheet Editor allows the user to: (1) enter information into the sheets, (2) change information in the sheets, (3) move through the sheets, (4) sort sheets, and (5) print sheets.

Importing Data

VOCM's Sheet Editor offers a simple and straightforward way to enter data into VOCM's emissions and growth data files. However, the user may prefer to use VOCM's import feature to enter data into the data files. With this method, the user first types the data into the ASCII (American Standard Code for Information Interchange) text files using a text editor. The user then has VOCM "import" (or transfer) the data from the text files into VOCM's data files.

The import method of entering input data has a couple of advantages:

- The input data can be entered faster. A user who is proficient with a text editor can probably type the input data into the ASCII text files faster than the same data can be typed into the data file sheets using the Sheet Editor.
- A text editor allows large blocks of data to be added and deleted with ease. Using VOCM's Sheet Editor, the data would need to be added and deleted a sheet at a time.
- The VOCM data file to which data are imported does not need to be empty. If it already contains data, the data that is imported are added to the end of the file. Thus, the user can import data from several different files into the same VOC data file.

Running a Projection

Once the user has provided the VOCM with the necessary input data, a projection can be run, generally involving two steps:

1. Entering projection specifications into the GLOBAL.DAT file sheet.
2. Selecting "Run Projection" from the main menu.

These steps are explained in greater detail in the VOCM User's Manual. Screen displays simplify the model's operation since the user has only to choose between the options offered. The user's manual will familiarize the user with the options available and provide initial configuration instructions for running VOCM on a personal computer.

For example, after the model is installed with data bases and started, the main menu guides the user in preparing the run specifications. VOCM then prompts the user for three items:

- The projection year(s).
- The ID(s) of the region(s) to be included in the projection.
- The ID(s) of the industrial category(ies) to be included in the projection.

In response to the prompt for the projection year(s), the user can enter any year from the base year to 70 years beyond the base year. For example, if 1985 is specified (on the GLOBAL.DAT file sheet) as the base year, the user could enter any year from 1985 through 2055.

After the user responds to the prompt for the industrial category ID(s), VOCM reads all data files, then begins a projection. VOCM begins to print the

requested output as soon as it finishes a projection. If the user requests projections for more than 1 year, VOCM prints the output for 1 year before it begins the projection for the next year. If the user indicates that the output be sent to a disk file (by entering a DOS filename in the "Printer Specification" field of the GLOBAL.DAT file sheet), the output is not printed on the printer.

Description of VOCM's Output

VOCM's output can be grouped into three categories:

- Intermediate projection results—This is detailed output, intended primarily for troubleshooting.
- Summary of input data—This output lists the contents of all the data files; it is useful for confirming that the correct input data are being used.
- Final projection results—This output provides the results of the emission projection; it is the output that the user generally wants to have generated for any projection.

Intermediate Projection Results

Intermediate output is intended to be used as a debugging aid, giving insight into how the final projection results were computed. Because this output is detailed and lengthy, its generation can be quite time-consuming. Therefore, it is recommended that this output be generated only for projections involving a few sectors.

Three types of intermediate projection results output can be obtained:

- Year-by-Year Projected Emissions Table.
- Emission Constraint List.
- Emissions Segment Tables.

Summary of Input Data

The second category of output consists of tables containing the input data. The contents of the cost data file are printed only when a cost analysis is performed; the contents of the aggregation data file are printed only when the projection results are aggregated.

Final Projection Results

The third category of output consists of the final projection results. The three different types of final projection results are:

- Regional Emission Projection Details.
- Regional Emission Projection Results.
- Overall Emission Projection Results.

Each of these is listed on the GLOBAL.DAT file sheet and can be obtained or suppressed by entering a Y or N (yes or no) character in the corresponding field.

The Regional Emission Projection Details output provides detailed summary information about each sector's projection. A separate table is generated for each region in the projection. Among the information included in each table are the overall growth rates for both attainment and non-attainment areas, the number of applicable constraints, whether a relative or absolute analysis was performed, and notes that warn of potential problems and/or omissions in the input data.

The Regional Emission Project Results output consists of an emission summary table for every region in the projection. Each table lists the base year and projection year emissions for each industrial category in the region as well as the total emissions from all industrial categories in the region.

If a cost analysis has been performed, this output also includes a cost summary table for every region in the projection. Each cost summary table lists the base year and projection year control costs, emission reduction, and cost effectiveness for each industrial category in the region as well as the absolute and percent change between the base year and projection year control costs. The table also lists the total control cost, emission reduction, and cost effectiveness for all industrial categories in the region.

M. Jennings is with Digital Kinetics, Inc., La Honda, CA 94020, and T. Emmel is with Radian Corp., Research Triangle Park, NC 27709.
***Larry G. Jones** is the EPA Project Officer (see below).*
The complete report of paper copy and diskettes, entitled "The Volatile Organic Compound Emission Projection Model User's Manual (Version 1.8)."
(Paper Copy Order No. PB 88-157 896/AS, Cost: $14.95)
(Diskettes Order No. PB 88-157 888/AS, Cost: $100.00, this cost includes the paper copy as well)
The above items will be available only from: (costs subject to change)
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650
The EPA Project Officer can be contacted at:
Air and Energy Engineering Research Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

United States
Environmental Protection
Agency

Center for Environmental Research
Information
Cincinnati OH 45268

Official Business
Penalty for Private Use $300

EPA/600/S8-87/059

☆U.S. GOVERNMENT PRINTING OFFICE: 1988—548-013/87027